

**PATENT**

LADDER ASSEMBLY FOR VEHICLES AND METHOD OF USING THE SAME

Background of the Invention

(1) Field of the Invention

5        This invention pertains to the field of vehicular ladder assemblies. More particularly, this invention pertains to a ladder assembly that is configured and adapted to be mounted to the upright tailgate of a vehicle and that is adjustable between stowed and operable configurations.

10    (2) Background

      Military personnel-transport trucks and utility vehicles are often provided with tailgates. Typically, such tailgates are adjustable from their normal upright position for facilitating egress and ingress of personnel onto or into such  
15 vehicles. However, in some situations, it has become increasingly desirable to maintain such tailgates in an

upright position, even though personnel must pass over such upright tailgates during ingress and egress. One such situation is when the compartment area of a truck or utility vehicle is lined with sandbags or other material so as to shield the personnel being transported therein from small-arm fire. In this situation, the upright tailgate often supports a wall of sandbags and therefore must remain in its upright position. In other situations, it may be desirable to enter and exit a vehicle over an upright tailgate simply to save the time that would otherwise be required to adjust the tailgate. Still other times, it may simply be that the tailgate is non-adjustable and therefore is always in an upright position.

Regardless of the reason for it being desirable to egress and ingress a vehicle by passing over the vehicle's upright tailgate, the tailgate nonetheless typically becomes an obstacle. As is especially the case with large military transport trucks, the height of the top of the tailgate when upright often makes it impractical, if not impossible, to simply jump or lift oneself over the tailgate when attempting to get into or onto the vehicle. Likewise, such height makes it more difficult to simply jump down from the vehicle without sustaining injury.

Although it is known to utilize ladders in connection with vehicles for various purposes, most often such ladders

are permanently fixed to vehicles and are non-adjustable. As a result, such ladders are often not practical for use in traversing upright tailgates.

5 Summary of the Invention

The present invention facilitates the passage of personnel over the upright tailgates of vehicles and is simple and practical to use. In general, the invention pertains to a ladder assembly that is specifically configured to be attached  
10 to an upright tailgate and that has other beneficial features.

In one aspect of the invention, a ladder assembly comprises a ladder and an attachment portion. The ladder portion has a plurality of rungs and is pivotally connected to the attachment portion. The attachment portion has a clamping  
15 device that is configured and adapted to releasably secure the attachment portion to an upright tailgate of a vehicle. Additionally, the ladder portion is selectively lockable in at least a first pivotal orientation relative to the attachment portion.

20 In another aspect of the invention, a method comprises a step of providing a vehicle that has an upright tailgate. This method also comprises a step of providing a ladder assembly. The ladder assembly comprises a ladder portion and an attachment portion. The ladder portion has first and

second sections and each of the first and second sections comprises a plurality of rungs. The first section of the ladder portion is movably connected to the second section in a manner such that the ladder portion is adjustable between a collapsed configuration and an extended configuration.

5 Additionally, the first section of the ladder portion is pivotally connected to the attachment portion and selectively lockable in at least a first pivotal orientation relative to the attachment portion. The method further comprises steps of

10 attaching the attachment portion of the ladder assembly to the tailgate of the vehicle, and pivoting the ladder portion relative to the attachment portion in a manner moving the first section of the ladder portion to the first pivotal orientation relative to the attachment portion. Still

15 further, the method comprises steps of locking the first section of the ladder portion in the first pivotal orientation relative to the attachment portion, and moving the second section of the ladder portion relative to the first section in a manner adjusting the ladder portion between the collapsed

20 configuration and the extended configuration.

In yet another aspect of the invention, a method comprises a step of providing a vehicle that comprises an upright tailgate. The upright tailgate has a top surface and opposite front and back sides. The method also includes a

step of providing a ladder assembly that comprises a ladder portion and an attachment portion. The ladder portion comprises a plurality of rungs and the attachment portion comprises an adjustable clamp. The ladder portion is  
5 connected to the attachment portion. The method further comprises attaching the attachment portion of the ladder assembly to the tailgate of the vehicle in a manner such that the attachment portion straddles the top surface of the tailgate. Additionally, the method comprises adjusting the  
10 clamp of the attachment portion in a manner such that the clamp applies a clamping force against the front and back sides of the tailgate.

Still further, in another aspect of the invention, a ladder assembly comprises a ladder portion and an attachment  
15 portion. The ladder portion has first and second sections, each of which comprises a plurality of rungs. The first section of the ladder portion is movably connected to the second section of the ladder portion in a manner such that the ladder portion is adjustable between a collapsed configuration  
20 and an extended configuration. Additionally, the first section of the ladder portion is pivotally connected to the attachment portion and is selectively lockable in at least a first pivotal orientation relative to the attachment portion. Moreover, the attachment portion of the ladder assembly is

configured and adapted to attach to an upright tailgate of the vehicle.

While the principal advantages and features of the invention have been described above, a more complete and  
5 thorough understanding of the invention may be obtained by referring to the drawings and the detailed description of the preferred embodiment, which follow.

#### Brief Description of the Drawings

10 Figure 1 is perspective view of a preferred embodiment of a ladder assembly in accordance with the invention.

Figure 2 is a side view of the ladder assembly shown in Figure 1 and is shown with the ladder portion in an operable configuration and the attachment portion shown attached to an  
15 upright tailgate.

Figure 3 is a side view similar to Figure 2, but is shown with the ladder portion in a stowed configuration.

Figure 4 is a top view of the locking mechanism of the ladder assembly of Figure 1, along with other select portions  
20 of the ladder assembly, and is shown with the locking members in the locking position.

Figure 5 is a top view similar to Figure 4 with the locking members shown in the unlocking position.

Reference characters in the written specification indicate corresponding items shown throughout the drawing figures.

5 Detailed Description of the Preferred Embodiment of the  
Invention

The preferred embodiment of a ladder assembly 20 in accordance with the invention is shown in Figure 1 and generally comprises a ladder portion 22 and an attachment  
10 portion 24. The ladder assembly 20 is configured and adapted to be selectively secured to an upright tailgate 26 of a vehicle as shown in Figures 2 and 3. The ladder assembly 20 is preferably formed of metal, such as aluminum or steel, or other suitable strong and rigid materials.

15 The attachment portion 24 of the ladder assembly 20 preferably comprises a main body 28, a pair of clamps 30, and a pair of cantilevered ladder braces 32. The main body 28 of the attachment portion 24 is preferably a frame-like structure formed of welded extruded strip material. As shown, the main  
20 body 28 comprises a pair of spaced apart columns 34 connected by a plurality of spaced apart beams 36. The ladder braces 32 are preferably cantilevered from the columns 34 of the main body 28 and are preferably welded or otherwise rigidly fixed thereto. Each of the ladder braces 32 preferably comprises a

first locking hole 38 that is axially aligned with the first locking hole of the other ladder brace. Additionally, each of the ladder braces 32 preferably comprises a second locking hole 40 that is axially aligned with the second locking hole  
5 of the other ladder brace.

Each of the clamps 30 preferably comprises a mounting member 42, a jaw member 44, a tensioning member 46, and a pair of locking nuts 48. The mounting member 42 is preferably welded or otherwise rigidly fixed to the main body 28 of the  
10 attachment portion 24 and preferably has a through-hole (not visible) for slidably supporting the tensioning member 46 in an orientation as shown in the figures. The through-hole preferably has a square cross-section. The jaw member 44 is preferably rigidly connected to one end of the tensioning  
15 member 46 and preferably comprises a plurality of gripping serrations 50 that face toward the tensioning member. The tensioning member 46 is preferably an elongate member having a square cross-section. A portion of the length of the tensioning member 46, from the end of the tensioning member  
20 opposite the jaw member 44, is preferably threaded. The locking nuts 48 are threadably engaged with the threaded portion of the tensioning member 46 and bear against the mounting member 42 of the clamp 30 to thereby allow the jaw member 44 to be adjustably forced and/or moved toward the



mounting member by the tensioning member. The two locking nuts 48 of each clamp 30 are preferably configured and adapted to be rotated by hand and can be tightened against each other so as to lock themselves in place relative to the tensioning member 46. The square cross-sections of the tensioning member 46 and the through-hole of the mounting member 42 cooperate with each other to prevent the tensioning member from rotating as the locking nuts 48 are adjusted.

The ladder portion 22 of the ladder assembly 20 preferably comprises first 52 and second 54 sections that are pivotally connected to each other by a pair of hinges 56. Each of the first 52 and second 54 sections preferably comprises a plurality of rungs 58 that span between a pair of spaced apart side members 60. The hinges 56 preferably connect the top ends of the side members 60 of the second section 54 to the bottom ends of the side members 60 of the first section 52. Additionally, the top ends of the side members 60 of the first section 52 are pivotally connected to the mounting member 42 of the attachment portion 24 about a pair of pins 62. The first section 52 of the ladder portion 22 also preferably comprises a locking mechanism 64 (shown in Figure 4) and a pair of arcuate handrails 66. The handrails 66 are preferably attached to the side members 60 of the first section 52 and preferably extend above the side members.

The locking mechanism 64 is positioned immediately beneath the lowermost rung 58 of the first section 52 of the ladder portion 22. The locking mechanism 64 preferably comprises a pair of locking members 68, a pair of housings 70, a pair of springs 72, a pair of linking members 74, a release member 76, and a brace 77. The locking members 68 are preferably cylindrical pins that are slidably engaged with openings 78 that extend through the side members 60 of the first section 52 of the ladder portion 22. One of the housings 70 is attached to one of the side members 60 of the first section 52 of the ladder portion 22 and the other of the housings is attached to the other of the side members. The springs 72 preferably encircle the locking members 68 and each is preferably compressed between one of the housings 70 and a stop pin 80 that extends through the corresponding locking member in a manner biasing the locking member toward the corresponding side member 60. The release member 76 is preferably L-shaped in a manner forming first 82 and second 84 leg portions. The first leg portion 82 of the release member 76 preferably comprises three equally spaced pivot fittings 86. The center pivot fitting 86 preferably pivotally connects the release member 76 to the center of the brace 77, which spans between the housings 70 and is rigidly connected thereto. The linking members 74 connect each of the other

pivot fittings 86 of the release member 76 to the ends of the locking members 68 as shown.

Configured as described above, the second leg portion 84 of the release member 76 acts as a release lever. In particular, when a pulling force is exerted on the second leg portion 84 in a direction generally away from the attachment portion 24 of the ladder assembly 20, a moment or torque is created about the center pivot fitting 86 of the release member 76, which acts to rotate the release member thereabout relative to the remainder of the locking mechanism 64. This rotation of the release member 76 causes the linking members 74 to pull and move the locking members 68 toward each other, against the biasing force of the springs 72, until the locking members are in an unlocking position as shown in Figure 5. When the release member 76 is released, the biasing action of the springs 72 urge the locking members 68 away from each other and back into their locking position as shown in Figure 4.

In use, the ladder assembly 20 is preferably secured to the upright tailgate 26 of a vehicle as shown in Figures 2 and 3. This is done by positioning the attachment portion 24 of the ladder assembly 20 against the backside 88 of the tailgate 26, with the clamps 30 straddling the top 90 of the tailgate in a manner such that the jaw members 44 of the clamps are

engaged with the front 92 of the tailgate. The locking nuts 48 of the clamps 30 are then tightened against the mounting members 42, which causes the tensioning members 46 to pull the jaw members 44 of the clamps toward the main body 28 of the attachment portion 24, thereby clamping the tailgate 26 therebetween. Once clamped, the locking nuts 48 of the clamps 30 are then tightened against each other to prevent them from inadvertently loosening. Additionally, the ladder assembly 20 is preferably further secured to the tailgate 26 by a strap, cable, chain, or the like (not shown) that tensions the bottom portion of the main body 28 of the attachment portion 24 toward an attachment point of the vehicle in a manner forcing the bottom of the main body of the attachment portion against the tailgate. This additional securing of the ladder assembly 20 to the tailgate 26 reduces bending stresses between the jaw members 44 and the tensioning members 46 of the clamps 30 caused by vibrations when the vehicle is moving and also reduces rattling of the lower portion of the attachment portion 24 against the tailgate.

When attached to the tailgate 26 as described, the ladder portion 22 of the ladder assembly 20 can be selectively adjusted between an operable configuration (as shown in Figure 2) and a stowed configuration (as shown in Figure 3). In the stowed configuration, the ladder assembly 20 is compact and

thereby minimizes any interference with the normal operation of the vehicle. In the operable configuration, the ladder assembly 20 allows people to climb into and out of the vehicle over the upright tailgate 26, with minimal effort.

5 In the operable configuration, the second section 54 of the ladder portion 22 extends beneath and is inline with the first section 52 of the ladder portion 22. In this position, the hinges 56 that secure the first 52 and second 54 sections of the ladder portion 22 together are fully extended such that  
10 the sections bottom-out against each other. Additionally, in this extended position, a releasable latch mechanism (not shown) preferably secures the first 52 and second 54 sections together to prevent the second section of the ladder portion 22 from pivoting back upward relative to the first section of  
15 the ladder portion. It should be appreciated that various types of latch mechanisms are well known and that any suitable type of latch mechanism could utilized for this purpose. Furthermore, in the operable configuration, the entire ladder portion 22 of the ladder assembly 20 is pivotally orientated  
20 relative to the attachment portion 24 such that the ladder portion is inclined. The ladder portion 22 is preferably fixed in this position by the locking mechanism 64. In particular, the ladder portion 22 is pivotally oriented relative to the attachment portion 24 in a manner such that

the second locking holes 40 on the ladder braces 32 of the attachment portion are axially aligned with the locking members 68 of the locking mechanism 64. As such, the locking members 68 extend at least partially into the second locking  
5 holes 40 on the ladder braces 32 and thereby pivotally secure the ladder portion 22 in the inclined orientation relative to the attachment portion 24.

As mentioned above, the ladder assembly 20 can be adjusted from the operable configuration to the stowed  
10 configuration. To do this, the latch mechanism preventing pivotal movement between the first 52 and second 54 sections of the ladder portion 22 is released and, thereafter, the second section is pivoted upward relative to the first section until it bears thereagainst. In this collapsed position of  
15 the ladder portion 22, another releasable latch mechanism (not shown) preferably secures the first 52 and second 54 sections together to prevent the second section of the ladder portion 22 from pivoting back downward to the extended configuration. This latch mechanism is preferably positioned near the upper  
20 most portion of the first section 52 of the ladder portion 22 so that it can be accessed by a person positioned in or on the vehicle by reaching over the tailgate 26. Again, it should be appreciated that various types of latch mechanisms are well

known and that any suitable type of latch mechanism could be utilized for this purpose.

Additionally, during the adjustment between the operable and stowed configurations, the second leg portion 84 of the  
5 release member 76 of the locking mechanism 64 is grasped and pulled in a direction away from the backside 88 of the tailgate 26, thereby releasing the ladder portion 22 in manner allowing it to pivot relative to the attachment portion 24. Once released, the entire ladder portion 22 is pivoted  
10 downward relative to the attachment portion 24 until the first locking holes 38 on the ladder braces 32 of the attachment portion are axially aligned with the locking members 68 of the locking mechanism 64. The release member 76 of the locking  
15 mechanism 64 is then released, thereby allowing the locking members 68 to move at least partially into the first locking holes 40 on the ladder braces 32 to pivotally secure the ladder portion 22 in orientation relative to the attachment portion 24.

The above mentioned steps can be reversed to adjust the  
20 ladder assembly 20 back into its operable configuration. However, during such procedure, it is preferable to adjust the orientation of the first 52 and second sections 54 of the ladder portion 22 relative to each other prior to adjusting the orientation of the ladder portion relative to the

attachment portion 24. Additionally, it should be appreciated that the locking mechanism 64 is preferably specifically configured and adapted so that the force and action required to unlock the ladder portion 22 relative to the attachment  
5 portion 24 acts in a direction that facilitates the necessary lifting of the ladder portion 22 required to bring it into the inclined position. This allows for single-handed adjustment of the ladder assembly 20 between its various configurations. Still further, it should be appreciated that the adjustable  
10 nature of the clamps 30 of the attachment portion 24 of the ladder assembly 20 allow the ladder assembly to be firmly attached to tailgates of differing thickness. Thus, the same ladder assembly can be firmly attached to a variety of types of vehicles.

15 While the present invention has been described in reference to a specific embodiment, in light of the foregoing, it should be understood that all matter contained in the above description or shown in the accompanying drawings is intended to be interpreted as illustrative and not in a limiting sense  
20 and that various modifications and variations of the invention may be constructed without departing from the scope of the invention defined by the following claims. Most notably, it should be appreciated that all of the elements or method steps described in reference to the preferred embodiment need be



present or performed. Thus, other possible variations and modifications should be appreciated.

Furthermore, it should be understood that when introducing elements of the present invention in the claims or  
5 in the above description of the preferred embodiment of the invention, the terms "comprising," "including," and "having" are intended to be open-ended and mean that there may be additional elements other than the listed elements.

Similarly, the term "portion" should be construed as meaning  
10 some or all of the item or element that it qualifies.